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THE BULLETIN, PUBLISHED BIMONTHLY, REPORTS THE CURRENT LITERATURE IN THE AREA OF SCIENCE AND PUBLIC POLICY. THE COVERAGE ENCOMPASSES BOTH "POLICY FOR SCIENCE" AND "SCIENCE FOR POLICY" MATTERS. SCIENCE IS USED TO DENOTE ENGINEERING, TECHNOLOGY, AND SCIENCE. THE BULLETIN IS INTENDED FOR PERSONS ENGAGED IN STUDYING, FORMULATING, OR IMPLEMENTING PUBLIC POLICY RELATING TO SCIENCE AND ITS USE. ITS PURPOSE IS TO AID SUCH INDIVIDUALS BY ALERTING THEM TO NEW ADDITIONS TO THE SCIENCE POLICY LITERATURE. THE INFORMATION PRESENTED CONSISTS PRINCIPALLY OF A BIBLIOGRAPHIC, PARTIALLY ANNOTATED LISTING OF CURRENT PUBLICATIONS IN THE AREA. PUBLICATIONS OF A HIGHLY TECHNICAL AND NARROWLY SPECIALIZED NATURE ARE EXCLUDED. THE BIBLIOGRAPHIC INFORMATION IS PRESENTED UNDER A NUMBER OF TOPICAL CATEGORIES WHICH ARE (1) GENERAL, (2) SCIENCE, DOMESTIC PROBLEMS, AND NATIONAL GOALS, (3) NEEDS AND ALLOCATION OF RESOURCES FOR SCIENCE, (4) NATIONAL RESEARCH AND DEVELOPMENT PROGRAMS, (5) SCIENCE, EDUCATION, AND THE UNIVERSITY, (6) SCIENCE MANAGEMENT AND POLICY MAKING BODIES, (7) SCIENCE, FOREIGN AFFAIRS, AND NATIONAL DEFENSE, AND (8) SCIENCE POLICY IN FOREIGN COUNTRIES. EACH CITED PUBLICATION IS RECORDED UNDER A SINGLE CATEGORY. THE NUMBERING OF PUBLICATIONS UNDER EACH CATEGORY RUNS CONSECUTIVELY THROUGH ALL ISSUES OF THE BULLETIN, SO THAT A GIVEN NUMBER REFERS TO ONLY ONE CITATION. MAJOR MEETINGS AND OTHER EVENTS IN THE SUBJECT AREA ARE ALSO REPORTED. (DS)

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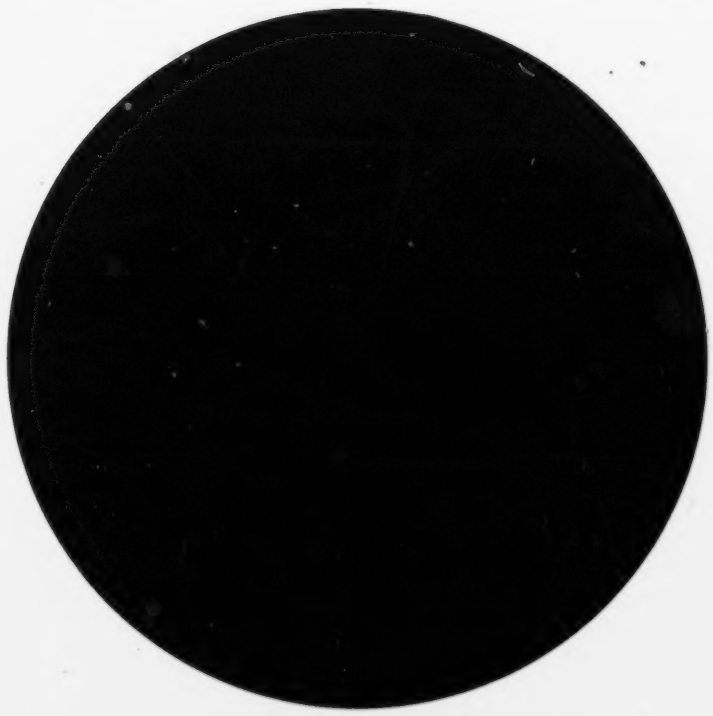

Science Policy Bulletin

Battelle Memorial Institute

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SCIENCE POLICY BULLETIN

The Bulletin, published bimonthly, reports the current literature in the area of science and public policy. The coverage encompasses both "policy for science" and "science for policy" matters. For brevity, "science" is used to denote engineering, technology, and science.

The Bulletin is intended for individuals engaged in studying, formulating, or implementing public policy relating to science and its use. The purpose of the Bulletin is to aid such individuals by alerting them to new additions to the science policy literature.

The information presented in the Bulletin consists principally of a bibliographic listing of current publications in the area. In addition, major meetings and other events in the subject area are reported.

The bibliography, although covering a broad topical scope, is selective in that publications of a highly technical and narrowly specialized nature are excluded.

The bibliographic information is presented under a number of topical categories. Each cited publication is recorded under a single category; cross indexing is not used. The numbering of publications under each category runs consecutively through all issues of the Bulletin, so that a given number refers to only one citation.

Copies of the listed publications are not available through Battelle but can normally be obtained from the originating agency.

The contribution of information to the Bulletin as well as suggestions and comments on its content, coverage, and format are solicited. All correspondence should be addressed to:

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BIBLIOGRAPHY

I GENERAL

94. "Regional Effects of Government Procurement and Related Policies", Report of the Independent Study Board, Economic Development Administration, U.S. Department of Commerce, U.S. Government Printing Office, Washington, D.C., December 1967, 46 pp.

The Public Works and Economic Development Act of 1965 (area redevelopment legislation) required the Secretary of Commerce to establish an independent study board to examine the effect of government procurement, scientific, technical, and related policies upon regional economic development. This, the resulting report of the board, reviews existing federal policies affecting regional development and concludes that "a sweeping reallocation in either Federal procurement or science and related activities to meet the needs of lagging regional economies" is not desirable. Minor adjustments in present practices are, however, recommended by the Board. The report provides considerable data on the impact of federal procurement by state and on the state-by-state-distribution of federal R&D expenditures. In addition, it recommends a group of changes in science-policy arrangements including a full-time science advisor reporting to the governor of each state.

95. Behrens, C., "Brash and Ebullient", Science News, v. 93, no. 12, 8 June 1968, p. 548.

The National Academy of Engineering (NAE) is gradually enlarging its membership and is undertaking projects in fields it regards as useful, important, and practically oriented. Ongoing projects include design of civilian airplanes, engineering education, ocean engineering, and technological assessment. "The NAE has been able from the first to concentrate on matters directly related to its work and not expend effort on setting up house", since "it was able to ensconce itself in the already functioning" National Academy of Sciences.

96. Sutherland, G., "Government and Science in Britain and the U.S.", Bulletin of the Atomic Scientists, v. 24, no. 4, April 1968, pp. 20-28.

"The differences between the British and American systems reflect differences in philosophy of government, in governmental machinery, and also in attitudes to the political control of funds for basic research. For many years the three top committees in the United States have been an integral part of the Executive Office of the President, whereas science policy in Britain only receives official recognition at higher than ministerial level, in 1967." This historical discussion of evolving governmental organization for science in Britain and the United States includes comparisons of the structures that have been developed to meet similar problems. While more differences than similarities exist, the author notes that both countries have considered and rejected proposals for a Department of Science, and both respect and support the independence of the research worker in basic science.

97. Brooks, H., "Physics and the Polity", Science, v. 160, no. 3826, 26 April 1968, pp. 396-400.

Brooks surveys the growing alienation between physics and society. Symptomatically this is evidenced in the United States by decreasing relative and absolute enrollments in physics, by cuts in financial support, and by a threatened loss of American leadership in world physics. The phenomenon is part of a growing world-wide revulsion against science, partly because of a confusion between science and technology. Physicists ought to re-examine the position of physics, with respect to: educating the public; understanding the relationship between physics and technology; recognizing the social consequences of physics; and ordering of priorities for research in physics.

98. Spaey, J., "Conditions for Success in the Economic and Social Development of Nations Through Science", The OECD Observer, no. 53, April 1968, pp. 32-34.

The chairman of the OECD Committee for Science Policy discusses "the increasing, and in certain respects, the decisive place taken by science and technology in the development and organization of industrialized societies". He suggests that the concept of "technological gaps" is being replaced by the "more positive ...

and more fertile concept" of conditions for success in innovation". The conditions for success in development through science, according to Spaey, center on several main themes: education; fundamental research; transfer of technology; choice of objectives; size of market and enterprises; and integration of the above factors "in an organization and management appropriate to the objectives pursued". The national and international measures needed to effect these conditions are described.

99. SSF Newsletter, Science of Science Foundation, London, v. 3, no. 3, April 1968, 16 pp.

The bimonthly Newsletter "is concerned with topics of interest in the field of the science of science" and includes activities of the Foundation, news, and reports dealing with science-policy matters.

100. Solandt, O.M., "Formulating a National Science Policy", SSF Newsletter, Science of Science Foundation, London, v. 3, no. 3, April 1968, pp. 5-13.

The Fourth Annual Science of Science Foundation Lecture, delivered by the Chairman, Science Council of Canada, deals with the major facets and issues involved in science policy, with special reference to Canadian efforts to formulate such a policy. He concludes that it is "now possible to formulate a national policy that can serve as a very useful guide for action in using science to contribute toward attainment of national goals". The major problem areas that remain include: techniques for formulating and stating national goals and priorities; better understanding of economic growth and productivity and their dependence upon education, science and technology, and management; principles for allocating effort in the different sectors of the scientific community; new and flexible government organizations capable of using science more effectively; a better understanding of mechanisms for the transfer of technology; and "methods ... for guiding the evolution of scientific activity within a nation".

101. Michael, D.N., "Technology and the Human Environment", Public Administration Review, v. 27, no. 1, January-February 1968, pp. 57-60.

The author feels "that there is no way we can deal with the social impacts of the new technologies, or the consequences of those technologies that have already had a substantial impact, without using more technology - both physical technology and social technology". Social engineering will increasingly be expected to analyze the

implications of other technologies and will affect the nature of plans made for their implementation. Adequate data are not available at present to document specific impacts of technology. "The fact is that in general we don't have enough detailed data about society to know what is happening to us, much less what will happen to us as a function of technology."

102. "Science, Technology, and Public Policy During the Ninetieth Congress, First Session - 1967", Report of the Subcommittee on Science, Research, and Development, of the Committee on Science and Astronautics, U.S. House of Representatives, Ninetieth Congress, Second Session, Serial O, U.S. Government Printing Office, Washington, D.C., 1968, 245 pp.

This report, prepared principally by W.H. Donnelly of the Science Policy Research Division of the Library of Congress, surveys "Government policy action relating to science and technology" during 1967. The report is organized around seven topics: R&D and National Goals; Governing the Applications of Science and Technology; Fostering the Applications of Science and Technology; National Resources for Science and Technology; Organization and Administration for Federal R&D; Federal Funds for R&D; Science, Technology, and Foreign Affairs. Ten appendixes "present an abbreviated summary of actions taken during the first session of the 90th Congress pertaining to science and technology".

103. Wolfle, D., "The Royal Science", Science Journal, v. 4, no. 3, March 1968, pp. 80-84.

"Plato called the liberal education needed by the rulers of the state the 'royal science'. What should be the nature of the royal science in a state in which democracy rules and in a time when science and technology touch every major decision?" The author presents his answer to this question and discusses associated aspects of science policy. "Administrators and the informed public need to understand at least the basic concepts of science and the organization of scientific work. Without this understanding the scientific elements present in all social and economic issues cannot be assessed and important projects will fail for lack of public support." "Science and technology have become so intricately and deeply involved in all the major policy decisions of a modern state that to abdicate an interest in scientific affairs is to abdicate informed participation in government."

104. Zaheer, S.H., "The Development of Science and Technology in Underdeveloped Countries", Scientific World, v. 12, no. 2, 1968, pp. 9-12.

The progress of science in the underdeveloped countries has been slow and is likely to continue so, yet it is their greatest hope for economic development, according to the former Director General of the Indian Council of Scientific and Industrial Research. In South America "religion, a feudal society and political instability" have impeded "utilization of modern methods" and given "a very minor place ... to the ... sciences". The emphasis in developing "countries is to become strong through armament build-up, and not through ... science and technology". In India, the importance of science has been realized, but implementation, investment, and faith in scientific programs have been inadequate. "The developing countries have ... made little progress towards achieving prosperity" because of (1) "the absence of enlightened leadership which would recognize the vital role of science in development", (2) "political instability and uncertainty, which induces politicians ... to give a higher priority to armed build-up than to education and development", (3) "lack of adequate indigenous resources in men, materials and ... know-how", and (4) "absence of ... aid and cooperation from the richer nations".

105. Sir Harrie Massey, "Problems of Science Policy", Proceedings of The Royal Institution of Great Britain, v. 41, no. 191, Part 4, London, 1967, pp. 379-479.

This lecture on "what science policy is all about" was presented at the Royal Institute for "new members of the Administrative Grade of Civil Service". "The problem essentially is to plan the necessary financial and manpower input to obtain optimum results from the point of view of the national life, not only the national economy but many other aspects such as health and defense." The policy issues, questions, and rationale connected with the support of basic and applied research, technology, and higher education are discussed, as well as the international aspects of science and technology.

106. "Scientists Gloomy on Science's Future", Scientific Research, v. 3, no. 10, 13 May 1968, p. 12.

Scientists "are growing increasingly concerned" about the constraints which "threaten the U.S. longstanding lead in big physics". These constraints include: (1) "The growing scarcity of federal funds for research and graduate studies." (2) "The clearly growing priority of the nation's urgent social and economic problems, which appears likely to consume funds that otherwise might have

gone to science." (3) "The new families of accelerators in the Soviet Union and Western Europe, which challenge U.S. leadership in physics." (4) "The new draft rules, which will gut graduate classrooms and laboratories and create critical shortages of science teachers and industrial researchers in the next few years." It is suggested that a "substantial restructuring and regrouping of federal agencies that might well be required to "sustain this nation in the vanguard of research".

107. Lipsitt, H.A., "Decision Making in National Science Policy", European Scientific Notes, v. 22, no. 4, Office of Naval Research, London, 30 April 1968, pp. 82-86.

This article reviews and discusses the recently published book, Decision Making in National Science Policy (edited by the Ciba Foundation and published by J. and A. Churchill Ltd.), which is the proceedings of a symposium held in London in 1967 by the Science of Science Foundation. Extracts of some of the major symposium papers are presented, along with comments; the papers cited include those by Sir Solly Zuckerman on the evolution of science planning in the U.K., Alvin Weinberg on the allocation of resources to science, Russell Ackoff on operations research in science policy, and William Carey on science policy making in the U.S. Additional papers deal with government-university relationships, cost-benefit analysis, research policy decision making in industry, and the science policy of various countries.

II SCIENCE, DOMESTIC PROBLEMS, AND NATIONAL GOALS

73. Dubos, R., "Adapting to Pollution", Scientist and Citizen, v. 10, no. 1, January-February 1968, pp. 1-8.

> The author believes that "an environmental catastrophe is almost inevitable because we have come to accept ... that pollution is one of the facts of life". He urges that "public bodies and the scientific establishment give high priority to the study and control of the forces ... making the earth ... unfit for human life". He lists three different approaches that "can serve as a pattern of social and scientific action for our environmental problems". They are: (1) "by enlightened and dedicated laymen who organize campaigns for cleaning up the urban mess and for providing the multitude with pure air, pure water, and pure food", (2) "by public health officers who organized boards of health and enforced a number of sanitary regulations, often against public resistance", (3) "by scientists, who organized new research institutes to study the problems ..."

74. Greenberg, D.S., "Defense Research: Senate Critics Urge Redeployment to Urban Needs", Science, v. 160, no. 3826, 26 April 1968, pp. 400-402.

> "In recent years ... as Soviet-American tensions have somewhat eased and domestic problems have become increasingly painful, more and more questions have been raised about the purposes to which the nation is putting its scientific and technological resources, and about the desirability of a large military role in the support of academic research." This article reviews some of the recent congressional actions and statements that express this growing concern. "It is yet to be determined whether domestic needs can underwrite American science and technology as effectively as Communism once did, but it is plain that the old motivation is rapidly declining and that politicians are beginning to grope around for new answers."

75. Kneese, A.V., "Why Water Pollution is Economically Unavoidable", Trans-Action, v. 5, no. 5, April 1968, pp. 31-36.

> Allen V. Kneese, director of the Water Resources and Environmental Quality Program of Resources for the

Future, seeks to explain the value of using welfare economics as an approach to water-pollution-control policy. "Many people who want an end to environmental pollution are in fact extremists ... To purify all of the nation's streams.... would cost, by a rough calculation, $20 billion a year - as much as this country spends for primary and secondary education!" While administrators tend to prefer rules and standards for pollution, economists tend to favor taxes or user charges upon polluters. Kneese reviews various studies of how much pollution costs society and concludes that major pollution-control actions cannot be justified on the basis of benefits to industry or to drinkers of water. He explores other justifications and studies of the costs of eliminating or reducing pollution.

76. "Immediate and Aggressive Technology Transfer Effort Urged", Chemical & Engineering News, v. 46, no. 20, 6 May 1968, p. 13.

A Senate Subcommittee on Science and Technology (of the Senate Select Committee on Small Business) has "urged Government and industry to join hands in an 'immediate and aggressive' effort to establish a workable system for making the results of federally-generated R&D known and available to potential secondary users". Labeling current technology transfer efforts 'inadequate', the Subcommittee recommends "a nine-point program to determine cost and demonstrate benefits of a successful transfer process". Some of the recommendations for all federal R&D-supporting agencies are: "include a new technology reporting clause in contracts; assure that intramural laboratories follow a proper identification and reporting procedure; separate the technology from a security classified context so that it may be furnished to all potential users; audit research results for possible use outside their primary missions; give discretionary authority to carry out adaptive work beyond their mission justification on more promising technological developments".

77. Sapolsky, H.M., "Science Advice for State and Local Government", Science, v. 160, no. 3825, 19 April 1968, pp. 280-284.

Factors inhibiting and enhancing the use of scientific advice in state and local governments are reviewed and discussed. Inhibiting factors include lack of technically trained personnel, small budgets, awkward organizational structure, high cost of research, and a lack of certainity that such research will be immediately

useful. Enhancing factors include a more equitable allocation of federal science funds to states (especially to those states that can offer technically sound proposals), and the increasing number of academic scientists that can promote research at particular localities. In general, the overall trend indicates that state and local governments will increasingly rely on the advice of scientists in the formulation of public policies.

78. Proceedings of a Conference on Regional Problems of Technological Transfer and Economic Growth in the Southwestern United States, Engineering Experiment Station, College of Engineering, The University of Arizona, Tucson, EES Series Report No. 17, 15-16 March 1968, 62 pp.

This conference, supported by the Office of State Technical Services, considered problems of technology transfer and economic growth, with special emphasis on those problems peculiar to the U.S. Southwest. Topics discussed include: (1) providing an environment for innovation; (2) protection for the entrepreneur; (3) motivating businessmen to use new technology; (4) problems associated with the regional transfer of small business; and (5) financing the entrepreneur.

79. Wolman, A., "Air Pollution: Time for Appraisal", Science, v. 159, no. 3822, 29 March 1968, pp. 1437-1440.

Various "aspects of air pollution abatement warrant scrunity. Solutions to some issues will undoubtedly take time. This fact does not make the search for answers any less important and may delay the application of ill-considered or capricious regulatory measures". The author calls for a realistic estimate of the annual damage (nonbiologic) done by air pollution, for an increase in "our understanding of the impact of air pollution upon man and his environment", and for greater attention to the economic implications of the regulatory measures before they are passed. Several other obstacles to achieving quality air are cited: "the difficulty of identifying relative causes and origins of pollution, of measuring the effects on man, plant, animal life, and property, of evaluating and setting reasonable limits on discharged constituents, of assessing technological means of correction, of determining costs and benefits, and of understanding economic impacts".

80. Carlson, J.W. (Chairman), "Secondary Impact of Air Pollution Abatement", Second Report from The Coordinating Committee on the Economic Impact of Pollution Abatement, Executive Office Building, Washington, D.C., 15 December 1967, 10 pp.

"This report summarizes the Working Committee's evaluation of the secondary impact of air pollution

abatement. The Working Committee on the Secondary Impact is part of a larger effort to look at the economic impact of pollution abatement as directed by the President." It is concluded that abatement of pollution "will have some adverse effect on the areas from which the fuel now being used is obtained. In the case of oil, the impact would fall primarily on Venezuela; in the case of coal, it would fall largely on certain of our major coal producing centers". The report discusses the characteristics and phasing of regulations that would minimize the economic impact while moving decisively towards the abatement objective; for example, a period of three to five years is recommended as a "reasonable period for orderly, gradual transition".

III NEEDS AND ALLOCATION OF RESOURCES FOR SCIENCE

61. "NIH Foreign Travel", Science, v. 160, no. 3831, 31 May 1968, p. 972.

NIH has issued a statement clarifying its travel-support policy by allaying fears that it has cancelled all foreign travel. Projected expenditures for foreign travel will be reduced "somewhat in excess of 25 percent" for all agencies in HEW. NIH will give preference to travel requests "essential for the performance of research covered by the grant or award". Individual requests for travel funds to international meetings "will, in most instances, be approved only when such travel is incidental to foreign travel essential for the purposes of the grant or award". "Grants will be renegotiated with responsible scientific societies to assure adequate U.S. representation at important international meetings."

62. NSF: Senator Warns Against Budget Lobbying", Science, v. 160, no. 3827, 3 May 1968, p. 518.

At a budget hearing before the Senate Independent Offices Appropriations Subcommittee, Sen. Gordon Allott (R-Colo.) warned NSF "to refrain from repeating the lobbying campaign that helped retrieve part of the Foundation's budget last year ... or there is going to be a ... detailed investigation into the situation". "No discussion was held on why NSF should be barred from ... playing a game that is blatantly engaged in by every other federal agency." The rest of the hearing was concerned with NSF's request for obligational authority totaling $527 million. "Thus, when the subcommittee came to NSF's social science program, ... details about some of the research ... in political science" caused considerable discussion on its value. It was also implied that the bill giving "NSF explicit authority to support the social sciences" was headed for "some trouble" in the Senate.

63. "Scientists Fight Back on Budget Cuts, Scientific Research, v. 3, no. 11, 27 May 1968, pp. 15-16.

"A campaign to get Congress to reconsider the cuts it has made in the budget of the National Science Foundation, and in other science budgets, was launched in

mid-May." "At the center of the campaign is ... Jerome Wiesner, former presidential science advisor ... and Arthur Kantrowitz, vice president and director of Avco Corp." The campaign - which has taken the form of "pleas and protests to the House and Senate" from individual scientists - has been criticized by Philip Handler, chairman of the National Science Board. He "believes lobbying in Congress should be done before decision-making takes place, rather than after", that any "lobbying should be done ... to help establish priorities and not to challenge the totality of Congressional action", and that the "blow is coming, no matter what" is done.

64. "American Science Manpower 1966", Report of the National Register of Scientific and Technical Personnel, National Science Foundation, NSF-68-7, U.S. Government Printing Office, Washington, D.C., December 1967, 221 pp.

"This publication, based on the 1966 National Register of Scientific and Technical Personnel, reports data on the supply, utilization, and characteristics of the Nation's scientific manpower resources." This includes data on education, specialization by work activity and technical field, type of employer, salary, age, sex, and other factors. Almost a quarter-million scientists are covered in the survey.

65. "NSF May Face Staggering Budget Cuts", Scientific Research, v. 3, no. 9, 29 April 1968, pp. 13-14.

"The National Science Foundation may suffer a severe cut in its '69 budget ... as much as 20 percent or some $100 million ... Some Washington sources fear the cut could go even higher." This article speculates on the prospects for a cut of this magnitude and on the impact which such a cut would have on NSF programs. All sources quoted indicated major difficulties if such a cut took place, with the greatest pressure falling upon new projects and less well-established research activities. An unidentified Bureau of the Budget official is quoted as saying, "it does seem clear that the Appropriations Committees are taking a hard look at r&d in general and the National Science Foundation in particular".

66. "Trouble for IBP", Science News, v. 93, no. 22, 1 June 1968, pp. 517-518.

W. Frank Blair, chairman of the U.S. committee of the IBP (International Biological Program), appeared before a Congressional subcommittee to ask for $5 million for fiscal 1969. His request was opposed by

Leland Haworth, director of NSF, and Ivan Bennett, deputy director of OST. The opposition apparently was motivated by the Administration's desire to cut the budget - "not because Congress is not in favor of IBP". "The 1969 NSF budget currently earmarks only $700,000 for IBP, though NSF hopes to offer additional support ... from its normal research funds." A special study of the progress and funding needs of the IBP will be conducted in conjunction with NSF's budget request for fiscal year 1970, to "determine whether IBP gets substantial special funding next year".

67. "AEC's Basic Research Budget for 1969", Scientific Research, v. 3, no. 8, 15 April 1968, p. 10.

The first of several steps in Congress' review of Atomic Energy Commission's budget was to slice $3 million off AEC's requested $280 million for physical research and $2.55 million off the $92.1-million request for the biology and medicine program. Some of the more specific budget cuts include: "high-energy physics research cut by $1 million to $119 million, chemistry by $1.3 million to $55 million, controlled fusion by $400,000 to $27 million, and metallurgy and materials research by $300,000 to $28 million - all relatively minor cuts". "The Joint Committee also said AEC should continue to finance and manage the federal research program, even though the program is not the exclusive responsibility of the AEC and could be jointly funded by various other agencies."

68. Greenberg, D.S., "NSF Budget: House Committee Votes $100-Million Cut", Science, v. 160, no. 3828, 10 May 1968, p. 632.

The House Appropriations Committee has concluded that the National Science Foundation (NSF) "has too much money in the bank from past appropriations - and, accordingly ... sliced $100 million" from NSF's request for the coming year. (For FY 1969, "the administration sought $500 million, plus $27 million that was frozen and later released in the current appropriation".) At the end of fiscal 1968, NSF will still have $657 million in obligated but unexpended funds plus $46.5 million in unobligated money from past appropriations.

69. "Senate Space Unit Restores Part of NASA Budget Cut", Aviation Week & Space Technology, v. 88, no. 21, 20 May 1968, p. 34.

The Senate space committee voted a net increase of more than $119 million for NASA's 1969 budget over that passed by the House. The total $4.15 billion recommended is only $.20 billion short of NASA's request. The Senate committee approved $2.025 billion for the Apollo program - "only $1.38 million below NASA's request". The additions voted by the space committee included: Apollo Applications, $96.8 million; nuclear rocket, $43.3 million; administrative operations, $32.4 million; lunar and planetary exploration, $10.1 million; and space applications, $13.5 million. The Senate space committee also cut $1-2 million from physics and astronomy, sustaining university program, human factors, and basic research. "House-Senate differences in the budget authorization will be compromised by conferees of the two houses."

70. Nelson, B., "Military Funds: Senate Whets the Ax for ABM, Research, 'Think Tanks'", Science, v. 160, no. 3830, 24 May 1968, pp. 860-864.

In the April "revolt" against military spending, the U.S. "Senate cut the authorization for R&D and for military hardware by 3 percent, after the committee had already sliced 3 percent from the Administration's request". The principal senators involved in the "revolt" and their criticisms are cited. These include: (1) propriety of Defense Department sponsorship of social-science research; (2) research that is sponsored by the Defense Department in foreign countries; and (3) the questionable value of Federal Contract Research centers such as IDA and RAND. "With better organization, the military budget-choppers hope to have better luck later on this session"; "it would be wrong to think that many important congressmen are not looking at military R&D with a critical eye".

IV NATIONAL R&D PROGRAMS

62. "Federal Arctic Research", Report prepared by the Legislative Reference Service, for the Committee on Appropriations, U.S. Senate, Ninetieth Congress, Second Session, Senate Document No. 71, (December 1, 1967), U.S. Government Printing Office, Washington, D.C., 1968, 313 pp.

This report, prepared by G.A. Doumani of the Science Policy Research Division of the Library of Congress, is an inventory of "scientific research in the Arctic region, performed by, or for, agencies of the Federal Government". The report describes the specific scientific projects and research activities of the agencies, including the level of funding. Among the findings and conclusions are: some 20 agencies currently spend about $40 million per year for Arctic activities; these "activities suffer from lack of coordination, cooperation, and adequate funds"; "the ... agencies need to effect a high degree of cooperation, establish a coordinated and coherent national program, formulate policies and national goals with long-range plans, and present an annual budget to insure continuity of the program ..."

63. Wenk, E., Jr., "Man and the Decade of Ocean Exploration", Keynote address, First Scientific Meeting of the Undersea Medical Society in conjunction with the Aerospace Medical Association, Miami, Florida, 9 May 1968, 19 pp.

The Executive Secretary of the National Council on Marine Resources and Engineering Development describes the national policy and program of the U.S. in oceanography, "from the vantage point of the President's Office". Included is a general discussion of the aims and accomplishments of the Marine Resources and Engineering Development Act of 1966, and a brief description of the "International Decade of Ocean Exploration" proposed by the President in March 1968. The "Role of Man in the Sea" is discussed, and some specific programs related to "undersea medicine" are proposed: search for new drugs; a man-in-the-sea facility; problems of safety; a data bank for the transfer of undersea medical technology.

64. McElheny, V.K., "Big Science: Tight Budgets Pinch Some Major Facilities", Science, v. 160, no. 3824, 12 April 1968, p. 172.

The impact of budget cuts on "big science" facilities in physics and astronomy are briefly described. The facilities surveyed include the Cambridge Electron Accelerator, the Stanford 2-mile accelerator, the Haystack radio telescope, and the Kitt Peak National Observatory. At each facility, budget cuts have forced sharp reductions in the number of operating hours; the staff has been decreased in some cases; and planned programs have been reduced in scope or postponed in other instances.

65. "Lunar Science Institute", Science, v. 160, no. 3831, 31 May 1968, p. 972.

The National Academy of Sciences (NAS) has received a $580,000 grant from NASA to establish and initially operate a Lunar Science Institute in Houston for studying materials brought back from the moon. "The institute's facilities are intended for study and conference purposes and will require little or no scientific equipment." NAS will operate the institute on an "interim" basis until a consortium of universities can be organized to take over. Universities Research Associates, Inc., has been approached to take over the lunar institute, but no decision has been made yet.

66. Malone, T.F., "Tinkering With Our Atmospheric Environment", Technology Review, v. 70, no. 7, May 1968, pp. 41-47.

This article gives historical background of attempts at weather control, the present state of the art, and a prediction that local weather and climate control will be a reality by the year 2000. In view of the potential benefits, as well as the legal and social issues involved in weather and climate control, the author suggests three steps should "be taken to influence the future course of events": (1) thoughtful planning on a national scale, (2) development of a coherent national program, (3) development of a basis for international cooperation in the research stage. Some progress is cited toward the goal of allowing weather modification to "enter our inventory of environmental controls with a minimum of unforeseen side effects and maximum social acceptance".

67. Wenk, E., Jr., "Federal Support of Marine Sciences", Remarks for the Hayden, Stone Forum on "Investment Opportunities in Oceanography", Washington Hilton Hotel, Washington, D.C., 25 April 1968, 11 pp.

This article provides "a look ahead" at the future of Federal Government and private-industry activity in development of the oceans. "During the past 20 months the Marine Sciences Council has been the focal point for developing Federal policies, and for mobilizing the diverse interests and capabilities of 11 Federal agencies into a coherent and strengthened national ocean program." The President has recommended a 15 percent increase in the budget for the Federal marine-science program. "Industry is expected to increase its involvement even as the Federal Government accelerates its own efforts."

68. Simpson, G.S., Jr., "The Evolving U.S. National Scientific and Technical Information System", Battelle Technical Review, v. 17, no. 5-6, May-June 1968, pp. 21-28.

"The author discusses the probable form of the U.S. information system as it will develop in the next decade. He considers the influence of the federal government on the process and suggests how a standardized system will eventually be adopted by both federal and private information systems." He reviews activities and problems of the government and private sectors. His view is that "the U.S. information problem is largely a reflection of problems in information management and organization".

69. Doumani, G., "Science Policy for Antarctica", Bulletin of the Atomic Scientists, v. 24, no. 4, April 1968, pp. 39-45.

"The year 1967 marked a decade of struggle between the legislative and executive branches of government over the power to formulate national policy for Antarctica. The period was marked by a multitude of bills and public resolutions, occasional hearings before several committees and subcommittees, and a final deterioration to mere briefings on what went on the year before." The author, who is on the staff of the Science Policy Research Division of the Library of Congress, describes the Antarctica research program, the administration and coordination of the program, legislative activity and concern, the budgetary and political priorities associated with the program (very low in both cases), and the ambiguity of the status of Antarctica and the "dilemma of jurisprudence" it poses.

V SCIENCE, EDUCATION, AND THE UNIVERSITY

47. "Handler Proposes Way to Soften Crisis in University Funding", Scientific Research, v. 3, no. 10, 13 May 1968, p. 19.

> The National Science Board Chairman "has been trying to formulate a new national policy to support higher education and research, particularly at the graduate level". To shield the university during times of budgetary crises, "he wants to return to the grant-in-aid philosophy". This would substantially reduce total federal funds to universities, but it would "let them know how much money they can count on receiving". Under this plan, grants would not pay faculty salaries, stipends to students, or indirect and overhead costs now charged by universities. Instead, the universities would pay all salaries and provide support to young researchers.

48. Price, W.J., "The Key Role of a Mission-Oriented Agency's Scientific Research Activities", Speech prepared for Symposium on Interaction of Science and Technology, University of Illinois, Urbana, Illinois, 17-18 October 1967, 31 pp.

> "[T]he best interests of the Nation will be served by continuing to provide the bulk of the university funds ... through the scientific research activities of mission-oriented agencies", according to the Director of the Air Force Office of Scientific Research. The effective and important working relationship between DOD and the university research community "will be seriously deteriorated if current trends [reduced DOD support of university research and increased use of limited DOD funds for specific program efforts rather than broader support] are allowed to continue". "... I believe that Congress is much more likely to understand and support a program which provides good balance between that for science-dependent mission-oriented organizations and that for NSF than it is to provide large increases for the relatively non-utilitarian NSF program." The paper describes at length the Office of Scientific Research's organization, history and operating philosophy.

49. "Draft's Doleful Toll", Industrial Research, v. 10, no. 5, May 1968, pp. 22-23.

The results and possible effects of last summer's revision in the draft legislation are reported in a survey conducted by the Scientific Manpower Commission and the Council of Graduate Schools of the U.S. The following results were cited: (1) graduate schools can expect total enrollment to fall 50 percent in the first-year class and 33 percent in the class of full-time, second-year graduate students; (2) physics and engineering graduate schools can expect first-year enrollments to decrease more than 60 percent. The predicted effects include: "Public institutions are more likely to be affected than private, because many of the latter have been limiting enrollments in the past"; undergraduate teaching duties frequently handled by graduate students will have to be cut back; and Ph.D. production will take a marked drop in the early 1970's.

50. "Project Themis - Where Does it Stand?", Scientific Research, v. 3, no. 9, 29 April 1968, pp. 27-28, and 31-32.

"Project Themis, the Defense Department's program to create new university centers of excellence in science, is off to a surprisingly smooth start." With 50 projects picked for funding in the first year, and 45 additional ones to be selected, the program is growing rapidly. It is "getting more high-level attention" than any of the other DOD research programs. The program is highly competitive; awards are based on the quality of proposals submitted, the relevance to DOD's mission, and a lack of substantive funding by DOD for the university submitting the proposal. Critics say that the project supports "unproven centers at the expense of those whose excellence is already established". The program is still regarded as experimental, and its results will be subject to continuing evaluation.

51. Danilov, V.J., "Turmoil on the Campus", Industrial Research, v. 10, no. 4, April 1968, pp. 70-74, 76 and 78.

Three factors related to campus turmoil are: the increase in the amount of R&D performed or administered by universities; the dependence of universities on the federal government for R&D funds; and the growing opposition by students and faculty members to the Vietnam war. Brief remarks are made regarding the impact of recent cutbacks on academic

laboratories, the increased proportion of applied research to basic research, imbalances of funding between the physical and life sciences, imbalances in geographical distributions of federal funds, the conduct of secret research, and the relation between leading universities and the research institutions.

52. Price, W.J., "Trends in DOD-University Relationships", Presented at the Colloquium on the Effects of the National Space Programs on Universities, University of Denver, Denver, Colorado, 4-5 April 1968, 11 pp.

This address, by the Executive Director of the Air Force Office of Scientific Research, discusses the "principal problems" in the relationships between the Department of Defense (DOD) and universities and describes the "steps being taken to resolve them". As the principal problem, the author cites "the cyclic changes over time in how" DOD-university relationships and DOD's role "appear to some persons within DOD, the universities, the Congress, and others". Other problems cited include: cutback in DOD funds to universities; results of Project Hindsight; DOD research classification and review policies; and Vietnam. DOD's present position and policies are discussed with emphasis on: increased funding of university research (DOD intends to increase support by 19 percent in '69, "regardless of the total funds appropriated to DOD"); resistance to pressures to shift from longer-range research to short-range payoff, and efforts to "increase the number of institutions doing high quality research".

53. Boffey, P.M., "Federal Aid: House Votes to Deny Funds to Campus Rebels", Science, v. 160, no. 3829, 17 May 1968, pp. 750-751.

The House of Representatives "voted to deny National Science Foundation support and various forms of Office of Education aid to individuals who participate in riots or who willfully commit serious infractions of university regulations". The House action was immediately criticized on a variety of grounds: it would (1) "... punish individuals without due process of law"; (2) "... discriminate against the poor, since they would not affect wealthy students ...", (3) "... constitute a threat to academic freedom since the government would ... be intruding in internal university matters", and (4) "... attempt to use scientific and educational aid programs as a punitive device ...". "Some observers think the restrictions are so unworkable and so unlikely to be invoked that it may not make much difference whether the legislation passes. Others believe the legislation might be challenged in court."

54. Greenberg, D.S., "IDA" University-Sponsored Center Hit Hard by Assaults on Campus", Science, v. 160, no. 3829, 17 May 1968, pp. 744-748.

Recent attacks and their effects on the Institute for Defense Analysis (IDA) and its university ties are discussed. The Students for a Democratic Society (SDS) have accused IDA of supporting an immoral war, exploiting the good names of university sponsors, and gaining the benefit of university sponsorship when IDA is not effectively under the control of university-appointed trustees. IDA's activities, especially as they relate to universities, are described, and other, earlier criticisms of the Institute are reviewed. Some of the effects attributed to these assaults on IDA are: several of the 12 universities are "cutting their ties" with IDA; each of the remaining universities is designating a trustee who will serve as an individual and not as the representative of the university"; and IDA's budgetary support has leveled off to $14 million from last year's $14.9 million.

55. "Education and the Federal Laboratories", Committee on Federal Laboratories, Federal Council for Science and Technology, March 1968, 90 pp.

This report is an "assessment of Federal laboratory educational activities and their present and potential relationships with universities". The study was undertaken "to determine how well Federal laboratories are doing in continuing educational efforts"; to "make recommendations for improvements"; and to "explore the potential of the Federal agencies in contributing more broadly to the educational activities of the Nation". Recommendations include: establish joint laboratory-university activities and programs; make unique laboratory facilities available to the scientific community; and issue policy guidelines for developing specific programs to improve laboratory-university relationships.

VI SCIENCE MANAGEMENT AND POLICY-MAKING BODIES

77. "Administration of Project Mohole by the National Science Foundation", Report to the Congress, by the Comptroller General of the United States, Document No. B-148565, U.S. Government Printing Office, Washington, D.C., 23 April 1968, 59 pp.

This report presents a critical review of selected aspects of the administration of Project Mohole and "views as to an alternative approach for ... conducting future research and development projects". The underlying factors which led Congress to discontinue funding Project Mohole were: (1) "the steady escalation of the estimated cost of the project after its inception", and (2) "the continual extensions in the estimated time to complete". An alternative approach suggested in the report for such new or exploratory projects includes sequential phases in order to determine: (1) whether project objectives can be met, (2) the means necessary to obtain objectives; and, (3) whether objectives are worth costs involved before a contractual commitment is made. These alternative procedures "would help provide a major tool in the control of costs and time schedules, without compromising technical objectives, thereby contributing significantly to the successful management of such projects".

78. "NSF Reorganization", Science, v. 160, no. 3831, 31 May 1968, p. 792.

"The Senate on 24 May passed a bill amending the National Science Foundation Act so as to broaden the Foundation's mission, strengthen the policy-making role of the National Science Board, and increase the administrative authority of the NSF director." The bill authorizes NSF to: (1) support applied research, (2) support the social sciences, and (3) make the National Science Board responsible for rendering an annual report on science. The only substantial difference between this bill and the one passed by the House last year is that under the Senate bill NSF would receive annual authorization for its appropriations instead of its current permanent authorization. The agency's supporters on Capitol Hill feel this will help NSF make a stronger case for its programs.

79. Boffey, P.M, "A New Round in Fountain Versus NIH", Science, v. 160, no. 3824, 12 April 1968, p. 168.

Rep. L.H. Fountain, chairman of the House subcommittee on intergovernmental relations, has charged "that a defense of NIH [National Institutes of Health] grant programs contained 'untrue or misleading statements' and endorsed 'flagrantly irresponsible' practices". This latest exchange between Fountain and NIH resulted from a highly critical subcommittee report last fall on NIH's grant policies and practices; NIH's response to the report, according to Fountain,was "not fully responsive" to the original charges and sought "to portray some weaknesses as virtues". In a letter to the Department of Health, Education, and Welfare (the parent organization of NIH), Fountain warns that his subcommittee will "closely monitor the health research programs until such time as your department takes decisive action to remedy the weaknesses disclosed by the committee".

80. "NIH Tightening Flow of Money to Its Grantees", Scientific Research, v. 3, no. 8, 15 April 1968, p. 57.

The National Institutes of Health "is drafting a new system ... proposed three years ago by the Fountain Committee ... to tighten control over the flow of money to grantees". A grantee will no longer receive his money in one lump sum, but will receive letters of credit from the Dept. of Health, Education, and Welfare, against which funds can be drawn as needed. This eliminates the government's loss of the use of money lying unspent, "as well as the interest on it". This new system is expected to go into effect before "fiscal 1969 funds become available".

81. "NSF to Move Into Social, Behavioral Applied Research", Scientific Research, v. 3, no. 9, 29 April 1968, p. 25.

"The proposed Daddario-Kennedy reorganization plan ... is expected to result in NSF's taking a much more aggressive position" in applied research and in the social and behavioral sciences. New policies are "being hammered out by NSF's National Science Board and NSF Director Haworth". The following areas, "all of them new for NSF" will be given emphasis "... even if NSF's funds for present programs are cut back": urban planning; pollution; isolation and crowding; biomedical engineering; human development; oceanography; food science; construction and transportation; and socioeconomic problems.

82. Greenberg, D.S., "The Press and the Politics of Science", Technology Review, v. 70, no. 7, May 1968, pp. 10-11.

"On the subject of goals, emphasis, and pace [in science], there is a valuable role to be played by public debate, but that role cannot be properly filled unless the press" reports the "politics of science" as well as the "substance of science". The failure of the press to report these political aspects is attributed partly to the belief that science does not have "a politics" (which "is not unrelated to the self-protective mystique that the scientific community has evolved"). "If ... the process of allocating resources for research had, for example, been thrown open to public scrunity, it is not unlikely that science ... would not have fared as well as it did under the ... closed-committee system. But the progress of science is not the ultimate value to be pursued in this society"; "if science is to serve society rather than simply be supported by it, there is no reason why society should not be cut into the decision-making process".

83. "Science Advisors to Congress Urged", Scientific Research, v. 3, no. 9, 29 April 1968, pp. 15 and 17.

This article describes a speech by George E. Pake, a member of the President's Science Advisory Committee, in which he urged creation of a science advisory committee for the Congress. Pake criticized the uncoordinated way in which science policy is now handled by the Congress and concluded that with such a new committee "there would be far greater opportunity for coordination of legislation and appropriations affecting scientific activities". He also proposed the establishment of a presidential advisory committee for the social sciences.

84. Reagan, M.D., "$17 Billion in Search of a Policy", Bulletin of the Atomic Scientists, v. 24, no. 4, April 1968, pp. 33-36.

Although science-budget expenditures have grown from $100 million in 1940 to $17 billion in 1967, "no other area of public policy has so much impact with so little public knowledge or understanding". While the need for an overall science policy is apparent, it is difficult to arrive at a clear answer to the question, "What is national policy regarding science and technology?" There is a crucial need for a politically acceptable framework for establishing priorities within overall research and development expenditures. A suggested set of priorities emphasizes

the following: (1) research connected with urgent social objectives; (2) science-related education at all levels, including public information; (3) small-scale, individually oriented undirected research; and (4) "big science" projects.

85. Donnelly, W.S., "The Science Policy Research Division of the Legislative Reference Service, The Library of Congress", SSF Newsletter, Science of Science Foundation, London, v. 3, no. 3, April 1968, pp. 4, and 14-15.

This brief account of the Science Policy Research Division (SPRD), provided by a member of its technical staff, describes the origin, purpose, and activities of the Division. SPRD was established in 1964 to "provide the Congress with information and analysis on policy question for science and technology". In this role, it provides "assistance to Congress for new legislation, authorisation of funds, oversight, and inquiries of constituents". "By its emphasis upon scholarly research and analysis of information ... the Division ... hopes to demonstrate how the Legislative Reference Service could function as a Legislative Research Service for the Congress."

86. Reinecke, E., "Who Makes Technology Decisions on the Scientist-Oriented Washington Scene?", American Engineer, v. 38, no. 5, May 1968, pp. 37-40.

The author, a congressman from California, notes "the meager smattering of engineering advisory groups midst a virtual sea of science of science advisory bodies" and calls for "additional engineering representation in ... Government advisory committees". The major advisory groups are surveyed for their scientist-engineer composition with the finding that most of the engineering advice comes from scientists. The author argues for the "need to be in the whirlpool of political and community affairs ... if technology is to make its weight felt in the formulation of Government policy".

87. Greenberg, D.S., "Federal Labs: Daddario Committee Holds Probe on Their Utilization", Science, v. 160, no. 3825, 19 April 1968, pp. 288-290.

A brief account is given of the hearings conducted by the Daddario subcommittee on Science, Research and Development for making "the best use of existing federal laboratories". Special emphasis was given to "such matters as finding new roles for laboratories that have completed their missions; the handling, by laboratories of one agency, of jobs for other agencies; the use of discretionary funds by laboratory directors; and the role that the laboratories might play in dealing with national problems such as crime, housing, and transportation". Other topics of the hearings dealt with the existence in

federal labs of "a substantial combination of talent and capital investment without a clearly defined job", and the lack of funds for laboratories to develop the findings into useful hardware and techniques.

88. "Haworth of the National Science Foundation: His Leadership is Under Fire", Scientific Research, v. 3, no. 11, 27 May 1968, pp. 29-30, and 32.

The Director of the National Science Foundation, Leland J. Haworth, "has failed to inspire the kind of political support that assures passage of a budget request. And until very recently, he has not taken the initiative in moving the Foundation into new areas of research, with the result that it remains about where it was when he took over five years ago". The "Foundation has failed to live up to the founders' expectations that it would assume an even-larger part of the federal responsibility for the support of basic research". Other failures and shortcomings of NSF are cited and attributed largely to the "ineffective leadership" of Haworth. Until his expected retirement in 1969, "few changes are looked for in his personal style of management. The future expansion of the Foundation into new fields ... must be executed by other hands".

89. Truman, D.B., "The Social Sciences and Public Policy", Science, v. 160 no. 3827, 3 May 1968, pp. 508-512.

The author, Vice President and Provost of Columbia University, discusses the relationships between social science and public policy, traces the history of the use of social science in public policy formulation, and notes an "apparently reduced concern of the social sciences for public policy". Factors in this reduced concern include increased isolation of social sciences from each other and increased emphasis on the assumptions and priorities of a discipline, rather than to the problems of the public. Partial solutions are proposed through (1) interchanges of university personnel and public administrators, (2) seminars between the social scientist and the administrator, and (3) multidisciplinary teams. Problems in educating potential public administrators are considered, and an "indisciplinary commission in the social sciences" is recommended for examining the problems and preparing an agenda.

VII SCIENCE, FOREIGN AFFAIRS, AND NATIONAL DEFENSE

74. "International Decade of Ocean Exploration", Report by the National Council on Marine Resources and Engineering Development, Executive Office of the President, U.S. Government Printing Office, Washington, D.C., May 1968, 7 pp.

This report elaborates the general features of the "International Decade of Ocean Exploration", a program proposed by President Johnson in March 1968. The program calls for a "decade of intensified and sustained international collaboration to plan, develop, and implement programs for exploring the world's oceans"; nations will be encouraged to identify how ocean exploration can contribute to economic and scientific development, and to develop and apply their capabilities to these ends. The report cites some examples of the types of international collaborative projects that might be undertaken, and announces the future formation of a government/nongovernment organization to plan the U.S. contribution to the program.

75. Weinberg, A.M., "Can Technology Stabilize the World Order?", Public Administration Review, v. 27, December 1967, pp. 460-464.

Weinberg makes another plea for the "technological fix" as a way of stabilizing the world. Technology can make wars, both large and small, fruitless; "spy" satellites can make disarmament agreements feasible; cheaper nuclear energy can make the have-not nations more prosperous. A condition of metastability might then arise in which the "social engineers" can devise more effective political instruments and better social institutions.

76. Vernon, R., "An Outsider's View of the Technological Gaps Report", The OECD Observer, no. 53, April 1968, pp. 28-31.

Commenting on the OECD report on technological gaps reviewed by the OECD Science Ministers at its 1968 meeting, the author, a professor at the Harvard Graduate School of Business Administration, interprets the emergence of two significant points: (1) "Research in the sciences outside of the United States is very far from moribund ... any assumption that the scientific community outside of the United States has lost its vitality and creativeness simply does not square with the facts." (2) "The industrial effectiveness of

nations depends much more upon their capacity to draw upon the existing body of basic scientific knowledge, wherever it may have been generated, than upon their capacity to contribute to that body of knowledge." Among the limitations seen on the efforts of nations to achieve technological independence are the growing dependence on the innovations of other countries and the high costs of developing advanced products.

77. "A Scientific and Technical Information Policy", The OECD Observer, no. 53, April 1968, pp. 36-38.

This article summarizes some of the findings of an OECD Scientific and Technical Information Policy Group set up "to identify the main policy issues on scientific and technical information and the scope for international cooperation in dealing with them". The Group has shown the need for the following kinds of national and international action: (1) "Identification of priority areas for international cooperation, and of the consequent policy issues and action for national bodies;" (2) "Cooperation in building up new international systems", and (3) "A concerted approach to common problems".

78. "Technological Gaps: Their Nature, Causes and Effects", The OECD Observer, v. 33, April 1968, pp. 18-29.

This study examines the nature of the technological gap, its causes, and its effects, as background for consideration at the 1968 Ministerial meeting of the OECD. In determining the nature and extent of technological gaps, the study presents information in the following areas: (1) differences among member countries in the development of scientific and technological capabilities; (2) differences in the performance of such nations in technological innovation; and (3) resulting economic effects, including also the effects of international economic and technological exchange. The conclusions of the Committee for "strengthening Europe's technological capability and research-intensive industries call for action on four levels: widening of the market; cooperation in government procurement for technologically-sophisticated products; the creation of industrial units of sufficient dimension to compete effectively in the advanced technological areas; and coordinated choice of areas in which to make an effort".

79. Burke, W.T., International Legal Problems of Scientific Research in the Oceans, The Ohio State University, (Columbus, Ohio), U.S. Department of Commerce Report, Clearinghouse No. PB-177-724, August 1967, 143 pp.

This study examines the "international legal problems actually or potentially involved in the conduct of scientific exploration and investigation of the marine environment and its resources, including the use of vessels, marine objects and structures for such purposes". The major sections of the study cover: (1) coastal regulation of scientific research in various kinds of ocean areas; and (2) desirable international agreements for facilitating scientific research in the categories of buoys, submersibles, continental shelf, and communications. Because of the relatively recent recognition of the ocean as an important source of food, wealth, and military strength, more nations are claiming jurisdiction over adjacent ocean and seafloor areas, thus hampering free access for research purposes and pointing up the need for more definitive international law on the subject.

80. Hornig, D.F., "Federal Research Laboratories", Science, v. 160, no. 3828, 10 May 1968, pp. 627-628.

Government research laboratories deserve more recognition as essential activities in the conduct of agency missions. The Special Assistant to the President for Science and Technology believes that they should receive recognition at a level comparable to similar activities in universities and industry. Among their advantages are: (1) rapid solution of new problems; (2) in-house utilization of world-wide scientific and technical progress; and (3) supervision of contract research. "Such activities are essential if agency missions are to be expeditiously carried out, and the use of in-house governmental aid to these ends is not only the most appropriate route but is also the one most likely to be cost effective in the long run." "The Naval Research Laboratory (NRL) in general and the Hulburt Center for Space Research in particular provide outstanding examples of what enlightened management and first-rate scientists and engineers can jointly accomplish in a government laboratory."

81. Miller, G.P., "A Parliamentarian's View of Science and Technology", U.S. Congressional Record, Thursday, 16 May 1968, pp. H4303-H4306.

The chairman of the House Committee on Science and Astronautics addressed the Consultative Assembly of the Council of Europe on disparities between the United States and Europe in science and technology. "The transfer of technological information is a subject of much concern to us. It is at the heart of the disparity problem." Computer utilization, educational technology, environmental technology, urban-development technology, oceanography, and communications are new fields "in which an extensive international collaboration is called for". In order to deal with these matters European Parliaments should: (1) establish committees on science and technology; (2) establish legislative reference services; and (3) hold frequent seminars on science and technology.

82. "U.N. Proposes Cure for Isolation of Scientists from Developing Nations", Scientific Research, v. 3, no. 10, 13 May 1968, p. 15.

A U.N. Advisory Committee on the Application of Science and Technology to Development has proposed "tnat American and Canadian universities and scientific institutes employ scientists in developing countries" as visiting associates for a specified time during each year. The proposed plan would be modeled after the system established at the Institute of Theoretical Physics in Trieste, Italy, where some 30 associates "spend one to three months a year for three years in residence, with the proviso that they spend the remainder of each year in their own countries". To overcome the possibility "that a taste of academic life in an advanced country might increase rather than cure the dissatisfaction of scientists from developing nations", two recommendations were made: (1) establish "joint research projects between scientists in advanced and developing nations", (2) exploit "the 'natural laboratories' in their respective countries ... that offer special opportunities for the study of particular phenomena".

83. "U.S. Ready for Worldwide Exchange of Scientific, Technical Information", Scientific Research, v. 3, no. 8, 15 April 1968, p. 15.

A new ten-point policy statement "... constitutes a manifesto by the United States that scientific and technical ... information is a global resource ... and that the U.S. stands ready to exchange such knowledge as freely as possible". The objectives of

the new policy, which has been approved by the Federal Council on Science and Technology, are: (1) "to establish international scientific information systems through which the worldwide scientific and technical literature will flow routinely into the U.S." and, (2) "to influence and encourage the establishment of standards so that foreign information systems and those of the U.S. will be compatible". The policy applies to "all agencies and departments of the U.S. government and their contractors", and encompasses, "'unclassified, unlimited, nonproprietary' information covering 'natural, social and information sciences' available to the U.S. public".

84. "Brain Drain", Science, v. 160, no. 3828, 10 May 1968, p. 631.

Some findings from preliminary studies on the migration of scientific and medical personnel were recently reported by the Adlai Stevenson Institute of International Affairs. These include: (1) "About 45 percent of foreign neurosurgeons who complete their full residency in the U.S. do not return to their homelands." (2) 49 percent of foreign students who receive M.S. degrees and 73 percent who receive Ph.D.'s in nuclear engineering do not return to their native countries. The low rate of return is attributed to "over-anticipation of the needs in developing countries ... when opportunity exists at home people do return".

85. Mason, J.F., "Contractors and Government Clash over Rules", Electronic Design, v. 16, no. 12, 6 June 1968, pp. 36-44.

"After five years of increasingly strained relations, the ties between defense contractors and Government negotiators are badly frayed." Never "has the red tape been redder or longer, and seldom have their opportunities for fair profits been more constricted". Some of the problems cited were: increasing paperwork, handling of catalogue items, the Renegotiation Act, reimbursement for overhead, handling of small purchases, treatment of government property in contractor plants, policies to discourage buying-in, delays, and interference in management. The article also cites some comments supporting the government's position and notes that many industry officials see merit in "a fact-finding commission ... to examine the whole complicated procurement picture ..."

86. Murcier, A., "Brains for Sale", Bulletin of the Atomic Scientists, v. 24, no. 3, March 1968, pp. 38-46.

The "brain drain" is a worldwide phenomena, but the flow has resulted in draining primarily the underdeveloped countries and Europe of talent in favor of the United States. The U.S. has gained both in quantity and quality from Europe, Asia, and South America, while Europe has gained from underdeveloped countries. Reasons for immigration are reviewed and discussed; counteroffensives attempted and proposed by the "drained countries" are cited, with the conclusion that they have been largely ineffective. The U.S. position on the drain, as reflected in congressional testimony by Eugene Rostow, Charles Frankel, and Charles Kidd, is criticized for minimizing "the evil consequences of the brain-drain".

87. "Defense Department Sponsored Foreign Affairs Research", Hearing before the Committee on Foreign Relations, U.S. Senate, Ninetieth Congress, Second Session, (9 May 1968), U.S. Government Printing Office, Washington, D.C., 1968, 98 pp.

These hearings deal principally with the Department of Defense's (DOD) activities in foreign-area research. Other topics include DOD-supported research by foreign countries, DOD-university relationships, Federal Contract Research Centers, and Project Themis. The general concern of the Committee was the legitimacy of DOD's responsibility for foreign-area research ("The research projects are not bad in themselves. It is the sponsorship that we question"), and its possible impact on foreign affairs. The main questions of concern to the Committee, according to John S. Foster, Jr. (Director of Defense R&D), who provided a statement and testimony, were: Has DOD assumed responsibility for research beyond its military mission? "What is the need for defense-sponsored research in or about foreign areas?" Does DOD believe that "a national requirement for foreign area-related research is principally its responsibility?"

88. Kilborn, P., "Science Makes the Embassy Scene", Scientific Research, v. 3, no. 10, 13 May 1968, pp. 39-41.

"... Both France and the United States have created new posts in their foreign services to raise science to levels of diplomatic prominence heretofore reserved for commerce and the military." "Maurice Levy, a ... theoretical physicist, has been assigned to ... the new post of scientific counselor at the French Embassy in Washington." "Washington has promoted Edgar I. Piret ... [a] chemical engineer ... to the new office of counselor for scientific affairs." The French are concerned with the "technology gap" and the "brain drain" and want to learn the explanation for "higher U.S. efficiency" in science. Levy will have

branch offices in Boston and San Francisco. Both Levy and Piret "put special emphasis" on exchange programs and feel that the "restructuring" of French education after the U.S. model may be necessary for French scientific progress.

89. Spencer, D.L., "International Transfer of Technology", Modern Age, v. 12, Winter 1967-68, pp. 14-23.

This article broadly, and in general terms, surveys "what is known about the international transfer of technology", how it generates economic growth, and its impact on the receiving country. Starting with a distinction between "technical knowledge" and "know-how", the author discusses the importance of "the aptitude of a people to acquire technology", the need for a nation to "build its own scientific and technical base at home in order to appreciate the advances in technology abroad", the determinants of successful transfer, and measures for encouraging transfer from the advanced countries. "It behooves the U.S. to seek ways to push forward the tendency to supply technology in order to compensate for the weak tendency to borrow so characteristic of many under-developed nations".

VIII SCIENCE POLICY IN FOREIGN COUNTRIES

128. Nelson, B., "Australia: Education and Science are Looking Up 'Down Under'", Science, v. 160, no. 3824, 12 April 1968, pp. 170-173.

This article surveys the present state of R&D in Australia, and discusses its problems and prospects. The country spends an estimated $225 million annually on R&D, most of which is government sponsored and conducted by government agencies. Criticism has been leveled at the lack of a science policy, inadequate funding of the biological sciences, and the lack of a policy on natural resources. As to the future, Australia plans to concentrate its R&D in areas of "special economic use or in [areas] in which it can make a special contribution", such as "radiophysics, optical astronomy, tropical studies, and marine biology".

129. Richardson, J., and F. Park, "Why Europe Lags Behind", Science & Technology, no. 77, May 1968, pp. 20-29.

Since World War II a technology gap between the United States and Western Europe has developed and is widening. "Whether it will continue to exist, or even become more serious in the final third of the century, depends on a complex interweaving of scientific, engineering, economic, cultural, and even political variables that virtually defy measurement." Europe does not lack intellectual or inventive genius, but rather the means for their effective exploitation. Critical factors working to the advantage of the United States include: large-scale competitive enterprises; carefully planned research and development; application of modern management techniques; and a more widely educated populace.

130. "Latin American Science Plight", Industrial Research, v. 10, no. 5, May 1968, p. 32.

"The scientific and technological situation [in Latin America] is far from achieving optimistic levels of progress", according to the president of the Inter-American Development Bank. At a seminar he cited these problems: (1) "less than 3% of gross national profit is earmarked for scientific education", (2) the "brain drain", (3) "scientists and technologist ... [are] scarcely 0.4% of the total

active population", and (4) "rich nations spent $140 billion ... on military activities in 1967, while only $7 billion went to foreign assistance". He stressed "the responsibility of governments, universities, and industrialists to diminish the technological gap", and the need for Latin America to internationalize in the ... development of its scientific investigation" and to "allot at least 1% of gross national profit for the formation of its own scientific researchers".

131. "$ - Object of Research", Industrial Research, v. 10, no. 5, May 1968, p. 32.

"Despite the fact that Britain is spending nearly $3-billion a year on R&D, more than any country in Europe, the U.K. is getting a low return on her investment", according to P.M.S. Blackett (president of the Royal Society). He contends that government policy is at fault for failing "to encourage growth of ... firms able to tackle R&D work", and that industry could have "done more to bring about a much greater concentration of ... effort in the rapidly changing science-based industries". He noted also that R&D was only a small part, typically one-tenth, of the total cost of successful innovation, but that such R&D should not be undertaken unless the other nine-tenths of the cost "were available to finish the job", i.e., to translate the R&D into "salable goods".

132. "Germans Put Science R&D Uber Alles; Budget to Increase 16 Percent", Scientific Research, v. 3, no. 8, 15 April 1968, p. 11.

"Bonn will increase its r&d spending by 16 percent this year - to a total of $925 million." "State and local governments and industry, collectively spending about 75 percent more than the federal government, are also planning ... record expenditures for r&d." The Minister of Scientific Research expects R&D to rise from 1.5 percent of GNP in 1964, to 2.4 percent in 1968, and 3 percent by 1970. The bulk of the federal R&D budget will go into construction of universities and research institutes and into nuclear research.

133. King, A., "Closing the Technology Gap", Nature, v. 218, no. 5144, 1 June 1968, pp. 815-818.

The technological gap between Europe and the U.S. is symptomized by American domination in research-intensive industries. In the U.S., research expenditures are higher and there is a greater interaction between education, basic research, and technology. Europe seems to be held back by educational institutions designed for a by-gone age, by problems connected with the smaller size of countries, and by lower mobility of scientists. The article recommends, as a partial remedy, more international cooperation in Europe and an overhaul of institutions bearing on research and development.

134. "Science Ministers Meet at OECD", The OECD Observer, no. 53, April 1968, pp. 16-17.

The opening statement by Gerhard Stoltenberg, Chairman of the Third Ministerial Meeting on Science of the OECD countries, reviews the first steps toward a coordinated international science policy. He sees the main tasks of OECD's effort to be "better reciprocal understanding of our different types of organization, achievements and plans, the exchange of experience and the joint investigation of common problems". The chairman noted that the OECD series of Country Reviews of Science Policy underscored the suitability of OECD for promoting scientific cooperation and partnership. "What is required from Europe is nothing more or less than a new spirit and approach. We Europeans must learn to think in larger dimensions when phasing our science policy in space and time."

135. "Third Ministerial Conference on Science at OECD", The OECD Observer, no. 53, April 1968, pp. 3-4, and 49-50.

Ministers responsible for science and technology in OECD member countries met during March in Paris. Major areas of review during the conference were: (1) technological gaps between member countries and their impact on social and economic development; and (2) meeting the rapid-growth needs of scientific and technical information through the promotion and organization of national

and international R&D. In the first area the ministers saw need for intensified national and international efforts to diminish technological gaps. In the second, the volume of scientific and technical information was making existing data handling systems inadequate; new techniques were recommended for coping with the problem.

136. "Irish Science Policy", Nature, v. 218, no. 5144, 1 June 1968, p. 802.

The new National Science Council, now in search of a secretary general, has been set up to "provide advice to the Irish Government ... on the best distribution of funds between the competing interests". Although the Council will not be dispensing funds of its own, it will be able to set up divisional councils devoted to particular fields of activity, such as, the natural sciences, engineering, agricultur, veterinary sciences, health and social sciences, etc. "The actual budget for science in Ireland is of course small (£3·83 million in 1963)", and "very nearly half the research expenditure goes on agricultural research, and another 39% ... on industrial research".

137. Malsimović, D.M., "Development of Scientific Research", Nature, v. 218, no. 5144, 1 June 1968, pp. 846-849.

"The current situation and trends in the development of research in Yugoslavia" are "regarded against the background of the entire progress attained in this field during the post-war period". Specific topics reflecting the changing science policy are discussed. These include: intervention of federal administration into the "limited field of scientific research", disparity between the scientific effort and the needs of economic growth, measures taken "to stimulate the interests of economic organizations in research and development", changes in the sources of revenue for scientific work and content of research, and mechanisms for allocating research funds.

138. Solandt, O.M., "The Science Council: The Search for a National Science Policy", Science Forum, v. 1, no. 2, April 1968, pp. 4-5.

According to its chairman, the ultimate goal of the Science Council is to have in Canada a well trained, well apid, scientific community that is organized and distributed throughout the elements of the nation in

a way that will best help in solving all the country's social and economic problems". Two dilemmas that face Canada in structuring a mechanism for formulating a national science policy are: (1) the disciplines of study that should be represented on the council; and (2) the relationships of the advisory body to the government. Created by legislation in 1966, the Science Council will be concerned with "the whole range of uses of science, extending from science education to research and development".

139. Gill, R.R., "Decisionmaking in Soviet Science Policy", Bulletin of the Atomic Scientists, v. 24, no. 4, April 1968, pp. 15-19.

The rapid growth of Soviet scientific research is producing growing pains and frequent reorganizations of its organization and structure. "The main problem of the past decade has been the constant pressure from the Kremlin to induce this enormous scientific establishment to engage in more applied research." Despite significant progress in special fields, such as rocketry and space research, the growth rate of productivity in the economy has fallen off steadily. Although there is a high degree of centralization in the allocation of funds, duplication of programs and lack of central administration result in waste. The lack of an efficient division of labor between institutions "frustrates scientific growth and hampers its contributions to economic growth".

140. Richardson, J., "Why Europe Lags Behind", Science & Technology, no. 77, May 1968, pp. 20-29.

This article deals with the nature and causes of the "technology gap" between Europe and the United States. The key elements of the gap are (1) general economic differences particularly in the scale of U.S. enterprises, (2) U.S. investment in Europe (although it is pointed out that this is an instrument of technology transfer), (3) disparities in R&D expenditures, (4) a management gap reflected in willingness to risk innovation, and (5) educational disparities in both technological and business education. The "brain drain" is also discussed before the article reaches its conclusion that "the technological lead of the New World over the Old Continent seems unlikely to be narrowed. Barring unforeseen cataclysm, the "gap" may indeed widen considerably".

141. "Bonus, Penalty System for R&D", Scientific Research, v. 3, no. 8, 15 April 1968, pp. 13 and 15.

"A bonus-or-penalty system for applied r&d is being introduced into Czech research laboratories." New guidelines for the management of research are: "(1) when new studies for solving specific problems are proposed, they are to be contested to prove their basic soundness, (2) the optimum time needed for solution of a problem is to be determined by means of a PERT (Program Evaluation and Review Technique) lattice diagram, (3) a laboratory that completes its assigned work sooner than the optimum time or with better results than set forth will get a special bonus, whereas labs failing to comply with stipulated conditions must pay a penalty". During the current (1966-70) Five-Year Plan, 35 billion Czech crowns (21 billion from the Czech government and 14 billion from state enterprises) will be allocated for R&D work.

142. Salomon, J.J., "Feasibility of Multilateral Co-operation", Nature, v. 218, no. 5144, 1 June 1968, pp. 819-821.

An "assessment of the outlook for European collaboration in science and technology" is presented by the Head of the OECD Science Policy and Resources Division. Several factors are considered in the assessment: the need and problems of pooling resources, the technical-political limitations of such cooperation, the politics and policies involved, and the competition of bilateral arrangements. The author concludes that "multilateral agreements are bound to develop and to multiply"; "Europe has no other means of raising its research and development effort to the level of its ambition".

143. Kendrew, J.C., "EMBO and the Idea of a European Laboratory", Nature, v. 218, no. 5144, 1 June 1968, pp. 840-842.

"After five years of discussion, the European Molecular Biology Organization is still without a laboratory, but enthusiasm for the idea is not diminishing." The article discusses the various dimensions of the cooperative effort required for such an undertaking, the obstacles to its realizations, and the advantages and disadvantages it would present. "Besides carrying out originial research ... the laboratory could be of great benefit to the European biological community, and to European universities, in many direct and

indirect ways." On the other hand, if molecular biology goes out of date, the result would be "wasted bricks, mortar and manpower in the years to come"; in addition, rare talent could be drawn away from the universities and an intra-European brain drain would result.

144. Mencher, A.G., "Management by Government: Science and Technology in Britain", Bulletin of the Atomic Scientists, v. 24, no. 5, May 1968, pp. 22-27.

From the viewpoint of the scientific attaché of the American Embassy in London, British science and technology policy is influenced strongly by the nation's determination to enter the Common Market. The Labor Government's four objectives for science and technology, as promulgated at the Scarborough Conference five years ago, seem "as distant and elusive as ever" in spite of considerable accomplishment during the interim. Prime Minister Wilson's proposal for a European Institute of Technology was well received on both sides of the Channel, but no specific action has resulted. The idea of pooling technology faces many hindering factors, but the urgency of the need for some sort of cooperation is stated for all to read by Servan-Schreiber in Le Défi Américain. Although the Ministry of Technology, Anthony Wedgwood-Benn's "Mintech", has developed several excellent services for British industry, there is reason to deplore the formalization of the split between science and technology in the shape of two ministries. The author devotes considerable attention to British education which still contains much of the 19th Century, but can point to a doubling of the number of universities since the war and a strong effort to broaden the educational base.

145. "Exploiting Technology", SSF Newsletter, Science of Science Foundation, London, v. 3, no. 3, April 1968, p. 4.

"A comprehensive review of Britain's present public research and development services" has been published in a report entitled "Exploiting Technology". The report reviews the importance of R&D, the role of the public sector, other Government help, and discusses various suggestions in these areas. Some of the principal recommendations include: (1) "The establishment of priorities by Government for the country's [R&D] effort; (2) Streamlining the public sector of [R&D] and the forging of a new partnership with industry; (3) Full participation by industry in the management

of government [R&D]; (4) Public R&D establishments and industrial firms linked so that the research establishments can give more direct aid to industry ..."

146. Harari, R., The Long March of Chinese Science", Science Journal, v.4, no. 4, April 1968, pp. 78-84.

The state of mainland China's science and technology, as viewed by four French scientists who recently visited the country, is presented and discussed. The synthesizing of insulin, and the development of an H-bomb are viewed as isolated achievements not characteristic of the whole of China's science and technology; other areas have been neglected while these accomplishments have taken place. "While the Government respects scientific thought and method, in no sense has it given research workers a free rein: it sets their aims and orientates their work." Although emphasis is on placing the results of science and technology to practical use, basic research is not ignored. Some 4,000 to 4,500 Western-trained scientists "form the backbone of Chinese research"; however, a new generation of scientists are appearing "who owe nothing to foreign training".

147. Pluhar, J., and Starnovsky, B., "Problems of International Co-operation in Research", Scientific World, v. 12, no. 1, 1968, pp. 21-24.

This article discusses some of the mechanisms and problems of international cooperation in science and technology, and describes the organization and specific modes of cooperation among the socialist countries under the Council for Mutual Economic Assistance (CMEA). With particular reference to Czechoslovakia, the authors describe the organization and planning of joint efforts in applied research and technology and discuss the special problems associated with cooperative basic research. Brief mention is also made of the cooperation between Czechoslovakia and "the capitalist countries", which has not yet "involved joint programmes of work". The cited problems include: the lack of a complete research chain "from the main discovery to its industrial realization", inadequate financial and technical resources of small countries, and questions of the "division of labor" among participants.

148. Enquiry Into the Flow of Candidates in Science and Technology Into Higher Education, Presented to Parliament by the Secretary of State for Education and Science, by Command of Her Majesty, Her Majesty's Stationery Office, London, February 1968, 171 pp.

This report, prepared by the Council for Scientific Policy, finds a significant relative decline in the number of students studying science and technology. Starting in 1968, it is estimated "the growth in the annual supply of scientists and technologists with university degrees is unlikely to amount to as much as 5 per cent per annum, that is probably less than half the present rate of growth". This "swing away from science to arts and to social sciences" is viewed "as a symptom of a condition in which science may be losing the esteem which its importance as an element in education deserves". The report presents statistical evidence for these and other conclusions, discusses the swing away from science in other countries, diagnoses the trend away from science, engineering, and technology in the U.K., and offers some remedies and recommendations.

149. "No Future for ELDO", Nature, v. 218, no. 5139, 27 April 1968, pp. 309-310.

Shortcomings of the European Launcher Development Organization (ELDO) are presented and the kinds of European collaboration needed on space research and related activities are suggested. The cited shortcomings of ELDO include: (1) "... there is no chance, this side of 1980, in competing with the United States or the Soviet Union in the launching of large communications satellites"; (2) it is apparent that ELDO is not serving "as a means of genuine collaboration on a European basis", but is merely "an adjunct to a national programme". The kinds of European collaboration recommended include: (1) an international agreement for governing the operations of satellites as they exist, and not organizations for launching satellites, (2) additional money for the European Space Research Organization (ESRO) - to create "political and commercial institutions for making fullest use of the opportunities which lie ahead".

150. Téllex, T., "Mexican Science: A New Era?", Bulletin of the Atomic Scientists, v. 24, no. 4, April 1968, pp. 46-48.

This report discusses the problems and prospects for a Mexican science policy aimed at the application of science and technology to economic development. The efforts, institutions, and plans involved in this undertaking are described. Mexico is now "spending slightly more than $12.5 million" on R&D, much of which includes training; this represents about .07 percent of her GNP. Research is concentrated in the agricultural sciences and steroid chemistry; the programs and their accomplishments in these areas are briefly described. It

is concluded that the implementation of a science policy, "if it is to be effective, will require a long-term investment in higher education and training", and "may well usher in a new era" for Mexico.

151. Walsh, J., "Social Science: British Council Has Key Role in Research Support", Science, v. 160, no. 3826, 26 April 1968, pp. 402-404.

The Social Science Research Council (SSRC), established in Britain in 1965, is "a separate government organization for the support and coordination of research and education in the social sciences". Its first chairman is Michael Young, "probably Britain's best-known practicing sociologist". The social sciences in Britain had "a late flowering", beginning with economics; Young dates public awareness of them at about 1960. The SSRC supports largely the areas of economics, statistics, political science, psychology, social anthropology, and management and industrial relations. The governing council of SSRC, with 10 to 16 members, "is responsible for making policy and awarding grants". Funds, which "have been modest, but are increasing fairly rapidly", have been split "between support of research and post-graduate awards", but the research proportion is expected to increase.

152. Coleman, H.J., "British Withdrawing from ELDO", Aviation Week & Space Technology, v. 88, no. 17, 22 April 1968, pp. 16-17.

Because of uncertain economic returns, the British government has announced plans to withdraw from the European Launcher Development Organization in 1971. "The British decision now leaves the entire future of ELDO in doubt, since British financial and technical backing over the years has kept the project moving, even during the period when the United Kingdom cut its spending percentage drastically." Future British space efforts will be limited primarily to its membership in the International Telecommunications Satellite Consortium (INTELSAT) and certain domestic programs.

153. "German Expenditures on Science and Technology: The Long-Range Outlook", International Science Notes, no. 19, International Scientific and Technological Affairs, Department of State, Washington, D.C., April 1968, pp. 10-11.

Examples of Germany's increasing attention to science and technology in terms of government expenditures are cited. (1) "On a per capita expenditure basis the Government now spends for non-military S&T $22 contrasted with the U.K.'s $26 and France's $21." (2) An increase of 81 percent is envisaged for the science budget. (3) Priorities have

been established in the following areas: Atomic Energy (total federal spending: 1967, $140 million; 1968, $166 million), space ($68 million for 1967; appropriations being increased until they reach $135 million for 1971), data processing ($11 million for 1967; allotted $75 million for the next five years), oceanography ($7 million in 1967; plans an average of $14 million a year by 1971), and university-level science education (by 1980 universities "are expected to accommodate an estimated 500,000 students of science in 1980, twice the present number").

154. "Italy's Planning for Science and Science Education", International Science Notes, no. 19, International Scientific and Technological Affairs, Department of State, Washington, D.C., April 1968, pp. 11-13.

Estimates of Italy's R&D expenditure by government agencies for 1966-1971 are cited, and the reforms which have accompanied the increase in R&D expenditures are described. A Five Year Plan for Development "increases the total from the figure of about 1060 billion lire ($1.696 billion) ... after including Italian contributions to international organizations, to 1320 billion ($2.112 billion)". "The principal increases appear to be the R&D allotments of the Ministry of Education, which is responsible for all fixed equipment in the university laboratories and the special fund of 50 billion lire ($80 million) for the proposed new Ministry of Scientific and Technological Research". Examples of reforms include: (1) updating "the education of future scientists and engineers", and (2) modernizing "the administrative regulations for government scientific laboratories".

155. "Science Policy: Fears of the Inquisition", Nature, v. 218, no. 5144, 1 June 1968, pp. 823-824.

An OECD appraisal of Italy's science policy concludes that "the National Research Council [CNR] which has primary responsibility for science research, lacks both the money and the means to direct an effective science policy". Specific criticisms include: (1) "... research funds are ... sparse ... by European standards ... with the exception of individual sectors, such as nuclear research and space research"; (2) "... there is no government body charged both with the responsibility of co-ordinating the whole field of scientific research and with the strength to fight for its decisions"; and (3) "the principal institutions of scientific research are firmly embedded in the organizational structures of their respective ministries with the result that the decisions of the CNR have little chance of being put into action".

156. Schneider, W.G., "NRC: Emphasis Needed in Applied Science and in Industrial Research", Science Forum, v. 1, no. 2, April 1968, pp. 6-8.

The President of the National Research Council (NRC) of Canada believes that the "long range goal of the NRC must be directed toward deploying science and scientific research for national benefit". Expanded activity by the Council is required because of the rapid change in the development of science, as well as in the social and economic climate of Canada. Among the national priority programs is a major expansion in industrial research which is required to accelerate economic development and to provide challenging opportunities for scientists and engineers. The NRC plans to give greater emphasis to the problems associated with industrial expansion by: (1) reviewing terms of reference for the funding of research projects proposed by industry, and (2) developing "the kind of close working relationship with industrial research laboratories that it now has with university laboratories".

157. Proceedings of the Special Committee on Science Policy, The Senate of Canada, Twenty-seventh Parliament, Second Session, nos. 9 through 14, Queen's Printer and Controller of Stationery, Ottawa, 1968, pp. 167-290.

This collection of hearings continues the effort of the Senate of Canada Special Committee on Science Policy to formulate a science policy for Canada (see item 119, p. 60, Science Policy Bulletin, No. 4). Witnesses included:

Dr. Christopher Wright, Columbia University
Dr. Hans Selye, University of Montreal
Dr. James Killian, Jr., Chairman of the Corporation, M.I.T.
The Honourable C.M. Drury, P.C., Ministry of Industry
The Science Council of Canada: Dr. O.M. Solandt, Chairman
Dr. R. Gaudry, Vice Chariman
Dr. Gordon Patterson
The Science Secretariet of the Privy Council:
Dr. J.R. Whitehead, Principal Science Advisor
Henry Flynn, Science Advisor
Dr. Richard Nelson, Economist, The Rand Corporation
Dr. Alexander King, Director of Scientific Affairs, OECD

A statement by each witness is presented, followed by a question-and-answer session with members of the committee. Topics included: the administration and financing of scientific research, the relationship between academic work and public affairs, communications channels between government and industry on science, proportionality between fields of research, priorities in space and in medical research, and parallel structures for science policy in other countries.

158. Samuelson, R.J., "Israel: Science-Based Industry Figures Large in Economic Plans", Science, v. 160, no. 3830, 24 May 1968, pp. 864-867.

New trends in the application of Israel's scientific talents to the development of industry are discussed. Specific signs of progress are cited: (1) "The Technion (Israel's M.I.T.) and the Weizmann Institute (which grants graduate degrees and concentrates on fundamental research) are establishing industrial centers near their campuses." (2) "The government has sponsored its own company to boost Israel into the computer 'software' market." (3) "One new electronics firm ... has just started exporting Israel's first computer." (4) "Science-based industry emerged as one of the 'stars' of a recent Economic Conference held in Jerusalem for high government officials, ... private businessmen and more than 500 ... foreign investors." Specific problems in R&D and Israel's major assets are briefly discussed.

159. "Over 2,000 Million Marks for Space Technology", Interavia, v. 23, no. 4, April 1968, pp. 444-446.

This article reviews two proposed intermediate space programs for the German Federal Republic, the first proposed by the National Aerospace Industries Association and the second by the Ministry for Scientific Research. Both programs reflect a decision to avoid a German booster program and to continue cooperation in space with both the United States and other European nations active in space work. Nearly half of the budgets proposed through 1971 would be devoted to International programs of various types. The article concludes, "It is nevertheless apparent that these draft planning proposals have every chance of materialising ... all of which means that the aerospace industry in Germany at the completion of this Intermediate Programme will be in a position to play a suitable part in future European programmes".

160. Lipsitt, H.A., "And Still the Brains Drain", European Scientific Notes, v. 22, no. 3, Office of Naval Research, London, 31 March 1968, pp. 70-71.

A recent British study shows a sharp increase in professional immigration during 1967. "Professional men and managers left Britain faster than ever during the second Quarter of 1967. 'The Registrar General's Quarterly Return for England and Wales,' No. 475 (HMSO, 2s6d) published in January, shows that there was a sharp increase in professional emigrants in that period, as compared to the same period in 1966. As well, the number of immigrant professionals decreased markedly. The net loss was 3,800: the same three months of 1966 produced a gain of 2,100."